Onset of childbearing and circular migration among women in rural South Africa: an event history analysis

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Overview

The emergence of unique patterns of human migration in South Africa can be traced back to 19th Century colonial rule. As the first inquisitions into mining capital were made, the future of South African land and life trajectories its people for were indelibly altered for decades to come. Subsequently, these patterns were solidified by the post World War II apartheid government's social and spatial structuring policies, predominantly administered through the infamous Influx Control and Group Areas Acts[1]. Grounded in an ethno-racial logic, these laws sought to control the mobility of Black Africans into urban areas by creating rural, ethnically homogeneous homelands on the pretext of granting the native populations governing autonomy. By 1959, at the zenith of segregationist practices, these social engineering policies had ensured the creation of "deliberate impermanence in the urbanization process of the South African black population" (Collinson et al., 2003:2). Stringently controlled black entry into urban areas, the creation of so called autonomous 'homelands' for Black Africans and simultaneous restrictions on Black land rights in rural areas resulted in extreme levels of poverty and overcrowding within these hinterlands.

One consequence of such policies was the "massive migration of able-bodied males to mining, industrial, and urban centers" (Ndegwa et al., 2004: 13). In contrast, African women were rarely included in the urban labor force requirements in apartheid planning. The need for black Africans to reside in the city was justified only to the extent that their labor was needed in the formal sector, in which women were not involved (Singh, 2007). In fact, in the earlier years of Apartheid, even domestic chores, traditionally seen as a women's employment sector, were carried out by men in White households, thus making black African women's presence redundant in urban areas (Bozzoli, 1991). Bank (2008) provides an in-depth analysis of how the apartheid project was embedded not only in segregation but also in technologies of patriarchy aimed at restricting women's presence in the African peri-urban settlements lest they should act as a corrupting influence on the productivity of African men servicing the White employers' needs.

With the advent of democracy in 1994 and abolition of mobility restrictions in early 1990s it was expected that the temporary or circular forms of migration would give way to permanent settlement patterns. But the uncertainty of urban formal labor markets due to high levels of unemployment, competition for resources in the urban informal labor sector and low returns from agriculture has created a need for maintaining circular migration as part of 'complex non wage livelihood strategies' employed by people in rural areas (Cross, 2000). Finding themselves in a situation of double jeopardy, migrants continue to maintain significant linkages with their rural homes that not only serve as safety nets in times of crisis but also a sustained resource to draw upon during the search for stable employment.

[1] These apartheid administration policies were meant as mechanisms of spatial and structural population control, restricting freedom of movement for 'Black', 'Coloured' and 'Asian' populations based on racial criteria. For more information, See Posel, D.1997. *The making of apartheid, 1948-1961: conflict and compromise.* Clarendon Press.

One noteworthy change in South Africa's migration dynamics has been the increased ranks of women joining labor migration streams. In 1995, just after the first democratic elections, 38 percent of all females between the ages of 15 and 65 were either working or actively looking for work in South Africa, and by 1999, this had increased to 47 percent (Casale and Posel, 2002). Data from the Agincourt Health and Demographic Surveillance System (HDSS) site shows that the proportion of women in the age group 35-54 who were migrants rose from 15% to almost 25% in three years (1997-2000), and those in the age group 15-24 showed a three-fold increase from about 6% in 1997 to 18% in the year 2000 (Collinson et al, 2003)

South Africa also has demographic significance due to its place in Africa's fertility transition. South African fertility rate is significantly lower than that of its neighbors in Southern and East Africa. Given the racial mix of its population and massive regional disparities in development, it displays demographic patterns of fertility that are typical of both developed and developing countries (Swatrz, 2002). There is a surprising lack of work investigating the relationship between migration and fertility in South Africa. Yet this relationship is likely to be an important one to understand, especially in the presence of the two demographic trends, namely, high levels of non-marital fertility and later age at first marriage. In 1996, the average TFR for African women who were never married or who were in a non-marital cohabitation was 3.9 and did not differ significantly from that of those who were married (4.3) (Chimere-Dan, 1999). At the same time, South African women continue to have an early age at first birth. Recent work by Hunter (2007) using several data sources also shows that both customary and civil marriages are on the decline in South Africa. Harrison (2007) documents Bledsoe and Cohen's (1993) work to suggest that one of the historical reasons for high rates of non-marital fertility in South Africa was the instability created by the mass migration of young men for cash employment that rendered the institution of marriage unstable due to several reasons. Ironically, as Harrison (2007) notes, in the post democratic era it is the entry of women in the urban labor force in the face of high levels of unemployment that has spurred on the formation of non-marital relationships that serve to reduce economic vulnerability.

Finally, studies in southern Africa "that give us a genuinely gendered understanding of the migration process, of the division of labor and its consequences for women's socio-economic status or health outcomes are scarce" (Singh, 2007). Women have predominantly been studied as partners of migrating men who are either left behind or who follow their husbands. As a result, the existing conceptual models are not gender-sensitive and therefore inadequate to explain the relationship between gender, migration, livelihoods and fertility. Gender-sensitivity, according to Boyd (2003), does not only mean using gender as a variable in a study or documenting a male or female participation in a particular field. Instead, it includes an understanding of how men or women engage with institutional and structural dynamics instead of conceptualizing activities such as labor migration in gender-neutral terms.

In the context of fertility, gender enters into a unique relationship with economic migration. For women, the physical act of childbirth itself may interfere with the demands placed by the labor market, at the new destination or affect the decisions to migrate in search of work in the first place. Although the undertaking of migration has the potential to affect fertility choices, it may also be possible that some types of migration (and livelihood) strategies are able to accommodate women's fertility preferences. In terms of the nature of labor

migration, migrant women are more likely to be employed in the informal sector as compared to their male counterparts, as the results from Agincourt DSS site show (Collinson, 2006). Data from the September 2005 South African national Labor Force Survey (LFS) confirms this to be in line with the national trend. (LFS, 2005). Patterns of circular migration in the context of high levels of labor force participation in the informal sector by a large number of black South African women may fall into the category of such livelihood strategies that allow for more flexibility in childbearing decisions.

We use a discrete-time hazard model to investigate the association between women's migrant status (modeled as time varying) on the probability of conception leading to first birth, net of other selected socio-demographic characteristics using data from Agincourt Health and Demographic Surveillance Site (AHDSS) in rural South Africa. In addition, we try to place this analysis within the awareness of South Africa's unique socio-historical context, recognizing that observable individual behavior as much a by-product of socio-structural and historical forces as much as it is of individual decision making.

This work is located at the intersection of two literatures (a) social structuring of life course that influences adult life outcomes and (b) demographic literature on migration and fertility that provides theoretical framework for the arguments being made and tested here. From the life course theorists, we borrow the view that an interaction between individual agency and structural elements of a social system determines pathways of life course at the population level (Hogan and Astone, 1986). On the fertility end, we situate my analysis within the well established framework of three main hypotheses, namely, selectivity, disruption, and adaptation. Rich (albeit inconclusive) literature is available on these determinants of fertility change. However, limited work has been done to understand individual fertility decisions within a narrative of historical-structural forces, which is crucial in a country like South Africa where migration, fertility and family formation behaviors have been influenced by state policies.

Within the context of the selected rural demographic surveillance site (details in a later section), this question is even more pertinent. Work by Williams et al (2008) has demonstrated that temporary labor migrant women tend to transition in and out of labor migrant status (calculated on a yearly basis) at a much higher rate than men. In other words, women's migration is more tenuous than men's migration. In the context of the prevailing patterns of circular labor migration, it is plausible sufficient flexibility is available to accommodate other life course events. The question then becomes about the nature and extent of association between type of migration and fertility decisions. In this paper, we examine this question with regard to the onset of first birth with the assumption that women would be more likely to undertake migration, especially for labor or other reasons like education, in their youthful years, which coincide with the time of onset of fertility. Demographic wisdom would then hypothesize that labor migration should lower the likelihood of a woman's onset of childbearing.

A life course perspective utilizing a corresponding event history approach for data analysis provides a useful framework to look at the interaction between these two life-course events. The examination of the determinants of fertility in the aforementioned DSS site is especially timely in the light of recent attention being drawn to Agincourt's total fertility rates that declined from 4.0 in 1992 to 2.3 in 2004 (Garenne et al, 2007). However, infant and child mortality rates have almost doubled during this period. As the fertility approaches below

replacement, it warrants a better understanding of fertility determinants at the population level.

Theoretical Framework

Bringing migration into a socio-historical and life course perspective:

Migration, as Jasso (2003) eloquently writes, "is rooted in time". It also embodies the four key themes of the life course study highlighted by Elder (1994) as "interplay between lives and historical time and place, linked lives, timing of lives, and human agency" (Elder 1994, in Jasso 2003). Despite the possibility of locating migration in this interactive, multi level framework of time and space (or perhaps due to its complexity), little work in migration studies has invoked such conceptualization. Much of the literature on migration (as well as on migration and fertility, discussed later) has conceptualized migrant status as a fixed state, which is determined by the residential status of an individual at the time of observation or at best, cumulative migration. Such a perspective is forced to dichotomize the population of interest into components of migrants and non-migrants, and carries out empirical enquiries within this framework.

One problem with such categorization is that it takes a cross-sectional view of migration as a 'stable' state, which under such categorization does not capture the complexity of circular labor migration in several developing country contexts in general an even more so in South Africa. Notable exceptions in this regard are work by Chattopadhya, et al (2004) in Ghana and Lindstrom and Saucedo (2002) on US-Mexico migration. In the non-time varying manner of modeling migration, the influence variable 'migrant' on the chosen dependent variable is then assumed to be equal for all those who are "migrants" irrespective of the pattern of the moves. Yet, as discussed in the previous section, labor migration, especially in societies with high levels of unemployment can occur as part of a complex livelihood strategy and may be time varying in its intensity/duration, frequency of return, remittance patterns etc.

However, there is little work that models migration as a time varying state. Even when a time varying perspective is taken, the emphasis is usually on the start (first move) and end point (last trip) of migration (see Orrenius et al 2008 for a recent attempt). Often, including the work of Orrenius et al, the time varying aspect is the comparative variation in the length of migration episode duration between US border migrants vs. migrants to interior parts of the US. An exception in this regard is work by Massey et al (2005) who model migration as a time varying state using retrospective migration histories. But even these authors do not move towards the incorporation of a perspective of 'migrant-hood' as social role that impacts and is impacted by other life course events such as childbearing in an interactive manner. As is the case with marital roles, a person may enter into a migrant role and then at a later state dissolve this role, only to be 'at risk' of re-entering it. This is This view on migration is in line with Rindfuss (1991) who argues for a shift in focus from 'transitions to' towards 'transitions in and out of' roles within life courses of individuals and how these impact upon other life course events. With this in mind, we use migration as a time varying independent variable to study the onset of childbearing among women in a rural South African site.

Demographic predictions regarding interdependencies between fertility and migration:

The key to thinking effectively about 'interdependencies' between migration and fertility in a life course perspective is to move away from thinking of then in terms of 'parallel careers' (Kulu and Mileweski, 2007) where one is the dominant role and other as shaping it. In line with this view, is a sociological perspective where migration is often conceived of as a process that takes into account social conditions and structures impacting upon and impacted by other life events. Migration may itself be conceptualized as a 'social process', especially when a group's migration experience has a significant impact upon the individuals in sending or receiving communities (Massey et al., 1987). However, depending upon the nature of migration as an individual vs. a collective event and a once-off or a phenomenon established over time, migration may be studied as a 'life contingency' (see for instance, Zhou's, 1999 work on China) or in terms of an established alternative pathway (for instance, Mexican migration to US as discussed by Lindstrom and Saucedo, 2002). Labor migration in South Africa can be conceptualized not only in terms of the alternative life pathway but also in terms of states that may change over time in terms of circular or temporary labor migration.

The existing literature provides three main mechanisms or competing hypotheses accounting for the relationship between migration and fertility, namely: selection, disruption and adaptation (see also Table 1). "The selection hypothesis refers to the tendency for migrants to be self-selected for individual characteristics- such as education, age at marriage, and employment- associated with a level of fertility that, even before the move, is lower or higher than the average of those who stay behind" (Chattopadhyay et al 2004). For instance, women from rural South Africa migrating to urban areas may already have a preexisting higher or lower inclination to have children based on their education status, marital status, ethnicity (cultural norms) etc .

Within the same cohorts there may be those who one can regard as "innovators" whose fertility choices may have been more impacted upon by the changes in a period (say, increased safe sex AIDS campaigns) than on others. The influence of such campaigns (for most part unobservable) may itself be dependent upon something observable such as education level. In turn, these innovators may also at the forefront of the migration process due to observable (e.g. education) or unobservable (e.g. adventurous nature) reasons and as such, selected for both migration and lower fertility. Destination preferences (e.g. distance from origin) may also play into migration decisions based on differing fertility aspirations, family size preferences and related location specific costs of maintaining a family, as shown by Lindstrom and Saucedo (2002). At the same time, the circular nature of labor migration in this region is likely to provide women with accurate information on the destination areas to allow for better informed decisions regarding migration as well as fertility planning. This could also fuel the selectivity in fertility decisions. If this is the case, then this effect is likely to be stronger for younger birth cohort since the older birth cohort would have been among the first to experience freedom for labor migration in South Africa.

Disruption is the second mechanism by which fertility differentials can arise. This could be due to spousal separation (more likely in the context of labor migration of men from rural

areas)[2]. Disruption effect could also take place through the desire to postpone childbearing while settling down in the destination area, most often in the short term period following the move. Both these examples seem to signal a decline in fertility. Alternatively, disruption may also work through changes in the proximate determinants of fertility (Bongarts, 1978), such as increased sexual exposure (due to higher availability of desirable men to form unions with) or changes in breastfeeding intensity and duration etc. The effect of the disruption is likely to be felt more significantly in the short term, and would most importantly reflect in the timing of a woman's fertility (Lindstrom and Saucedo, 2002), such as delaying the first birth subsequent to migration as compared to non-migrants with similar individual characteristics.

The third mechanism is that of adaptation to the destination fertility regimes. From a sociological perspective, this occurs via a process of social leaning about fertility through diffusion of knowledge about norms (Cadwell, 1981). In this sense, this effect is likely to express itself over time, and even over generations. In economic terms, adaptation may also occur as women try to limit their fertility to create situations more compatible with their newfound position in the labor market i.e. adaptation for the sake of role compatibility. Chattopadhyay et al (2004) contend that adaptation effect may not affect the fertility of temporary migrants who do not settle in the destination area in the same way as permanent migrants to but remain in touch with the social norms at the rural origin. Selectivity and adaptation effects are often difficult to separate (Chattopadhyay et al 2004) but can be attempted by introducing additional covariates. With regard to selectivity, covariates such as education status, age, marital status etc. can be introduced. With respect to adaptation, one can include a cumulative measure of time spent in the destination. The nature of migration, such as that for labor purposes versus other purposes can itself be seen to capture the role compatibility hypothesis net of other factors.

Data and the context:

The data for this study comes from the Agincourt Demographic and Health Surveillance System, a rural South African DSS site located in a former homeland in Bushbuckridge district, a sub-district in Mpumalanga Province, near Mozambican border (See Figure 1). The HDSS began in 1992 and ever since the census is updated annually and information on births, deaths & verbal autopsies, in/out migrations, household relationships, education are collected. The population has low levels of education, high rates of unemployment and high rates of circular labor migration. Table 1 below summarizes some of the characteristics of the site.

[2] The inclusion of spousal separation was not possible with the current dataset but additional data has been requested from the site to incorporate such an analysis in the final multivariate analysis.

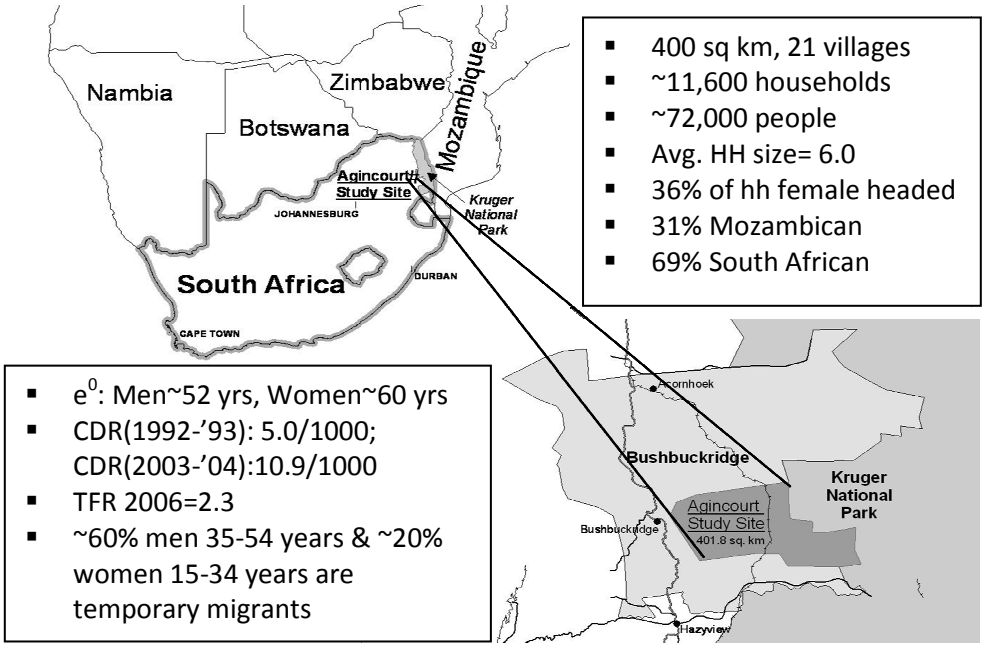

Figure 1: Location of the Agincourt Demographic and Health Surveillance System

Study sample

To carry out this analysis, we use the sample of women born from 1978 to 1998 (aged 9 to 29 in 2007) and starting their observation period in this study from the point that they turn age nine. These will be subject to a minimum threshold of a residency episode of five years or greater in the site. We use an age-specific formulation of cohorts based on age at the last census round. Given that the first observation period for this study starts from 1992, we am looking at migrant and non-migrant women's retrospective and prospective pregnancy history and prospective migration history. The reason for selecting this sample of women is because complete migration and fertility histories can be estimated for this age group. While fertility histories are available for all women living in the site, migration histories were only recorded prospectively since the site began collecting data. As a result, we only utilize the sample for women migration histories can be reasonably established with minimal interpolation since each individual woman turned nine years old.

Cohort analysis will help us better understand the effect of historical changes happening in South Africa which are likely affect different cohorts' migration as well as fertility patterns differently. For instance, the ease of transition into a migrant role may be influenced by the abundant availability of information and social capital at destination areas for the younger birth cohort. In contrast, the older birth cohort (1978-1987) saw migration as less of an established phenomenon among women as compared to the younger birth cohort. Also, in the context of HIV, contraception and unsafe sex has been more prevalent in discussion for the younger birth cohort and might have an effect on decreasing their onset of childbearing. Table 2 provides summary statistics on key characteristics of the study sample.

Table 2:Descriptive Characteristics of the Sample

Characteristic			
N	19,174		
Age (mean) [a]	17.23		(2.59)
Nationality			
South African	66.96	%	
Mozambican Pre 1992	8.15	%	
Mozambican Post 1992	24.81	%	
Other Nationality	0.10	%	
Ever Married	5.59	%	
Age at first marriage (mean) [a]	18.53		(2.91)
Birth Cohort			
Birth Cohort 1989-98	49.51	%	
Birth Cohort 1978-87	50.49	%	
Highest Education at Last Observation			
No Education	6.25	%	
Adult	0.05	%	
Primary	45.98	%	
Secondary	45.96	%	
Tertiary	1.55	%	
Unknown	0.21	%	
Ever Been a Labor Migrant	13.33	%	

[a] Numbers in parentheses are standard deviations

Dependent variable

Fertility outcome of interest is 'conception leading to first birth'. We have selected the conceptions leading to live first birth as the data on abortions and stillbirths is not reliable due to underreporting.

The DSS collects retrospective maternity histories for each woman who is enumerated (first observed when the DSS started) or who is an external migrant into the site after its starting year. For those who are born in the site and continue to be affiliated with the site as temporary migrant or permanent resident, prospective migration histories are recorded. However, there is one instance that this information is difficult to discern. This is the case of women who migrate within the site (e.g. move households from one village to another) may be recorded using two different IDs. In several cases, these IDs can be reconciled based on information on other individual charancteristics. However, there is a minority of cases that

cannot be resolved without going back to the source documents that are not available to the researcher and have not been used in this analysis.

Independent variables

The primary independent variable of interest used in this analysis will be 'Residential Status' modeled as a time varying covariate. Within the Agincourt HDSS, the field definition used to identify temporary labor migration is the time of residence in the site. Someone who is away from the household for six months or more but is still considered part of the household is categorized a temporary migrant i.e. the household respondent expects them to come back and enumerates them as a household member. This information is combined with that on the purpose of migration as 'employment' or other reasons to come up with the category of temporary labor migrant. Therefore, households include the permanent (P) household members and the temporary labor migrants (M) and other non-labor temporary migrants (O), like students. In each yearly census round number of months living in the site is recorded for anyone classified as P or M or O. Using this information on from the Residence Status table and combining it with the Household Membership episodes, a time varying residence status variable was calculated for the person year data file used to carry out the event history analysis.

For some of the women, we only have a window on the prospective migration histories of their life course from the time that they were exposed to the study site. While we would be able to build their retrospective fertility histories, we would not know about their migration status before they (1) when the study was started in 1992 or (2) when came first in-migrated to the study site. To address this problem of missing life time migration history, the initial migrant status as noted in 1992 or on first observation in the site will be taken as a proxy for the prior migration history. Since we am dealing with women born from 1978 to 1998, the oldest woman enumerated into the site at in 1992 would have been 14 years old at that time. In most cases therefore, it is perhaps safe to interpolate the residence status of the previous four years as same as the one observed at age 14.

Apart from residence status, the multivariate analysis includes age and a squared age term to account for any quadratic relationship between age and onset of childbearing. We also control for a woman's ethnicity, any education and birth cohort as non-time varying covariates. In addition to residence status described above, other time varying covariates included in the analysis are marital status and cumulative migration experience (See Table 3).

Table 3: Variable Definitions

Dependent Variable	
Conception	=1 if there is a conception event leading to a live first birth
Independent Variables	
*Age**	Age in decimal years
Nationality	=1 if the individual is a South Africa, 2 if pre-1993 Mozambican (refugee), 3 if other nationality, 4 if post-1992 Mozambican
*Marital Status**	=1 if in any formal or informal marital union, 0 otherwise
*Migrant Status**	
Permanent Resident	=1, Resident in the site more than six months of the year
Migrant: Temporary Labor	=2, Resident in the site less than six months of the year, migrated for labor purposes
Migrant: Other Reason	=3, Resident in the site less than six months of the year, migrated for purposes other than labor, especially education and for family reasons
Other Residence Status	=4, Not part of the household/visitor/unknown status
Birth Cohort	=1 if born between 1988-1998, 2 if born between 1978-1987
Education	=0 if no education, 1 if at least primary education, 2 if unknown education status
*Cumulative migration experience**	Based on cumulative increments of counts every time a person is classified as a labor migrant

*Time varying variable

Multivariate Model

Following Goldstein et al (1997), Chattopadhyay et al (2004) and Lindstrom and Saucedo (2002), we use discrete time hazard model to analyze the association between residence status in the previous year with the probability of a conception leading to first birth in a given year, controlling for other individual characteristics such as age, marital status, education level and ethnicity. we use a person year exposure file from age nine onwards censoring at the time of first conception (failure event) or the last observation (right censored). The *discrete time hazard model* (sequential logit model) utilizes person years data structure to estimate the probability of first conception. Within this model, the log odds of a conception occurring in a year t are given by:

$$\ln\left[\frac{p_{it}}{1-p_{it}}\right] = b_0 + \sum b_i X_i + \sum b_j X_{jt} + e_{ijt}$$

where X_is represent fixed covariates (such as ethnicity, birth cohort etc.), X_{jt} represent time varying covariates (such as migration status, marital status.) as described in Table 2 below.

Findings

A total of 19,174 women are included in the sample, with a total of 151,634 person-years of follow up time. A total of 5,280 conceptions (leading to live first birth) were observed.

Median time to first conception was 21 years, with 25% of the sample having a first birth by 17 years, showing early onset of childbearing in this population.

Table 4: Discrete Time Logit Model for Conception Leading to First Birth (Log Odds Coefficients)

	(1)	(2)	(3)	(4)	(5)	(6)
Individual Characteristics						
Age[b] (Lagged)	2.233***	2.210***	2.199***	2.199***	2.171***	2.192***
	(0.0486)	(0.0487)	(0.0488)	(0.0488)	(0.0488)	(0.0491)
Age-Squared[b] (Lagged)	-	-	-	-	-	-
	0.0612***	0.0603***	0.0599***	0.0599***	0.0595***	0.0602***
	(0.00148)	(0.00148)	(0.00148)	(0.00148)	(0.00148)	(0.00149)
Nationality						
(South African)[a]						
Moz Pre 1992			-0.596**	-0.593**	-0.485*	-0.516*
			(0.263)	(0.264)	(0.264)	(0.265)
Other Nationality			-1.225	-1.226	-1.220	-1.215
			(1.015)	(1.015)	(1.015)	(1.015)
Moz Post 1992			0.131***	0.132***	0.140***	0.128***
			(0.0319)	(0.0321)	(0.0320)	(0.0321)
Marital Status[b] (Lagged)						
(Not in Union)[a]						
In Union						0.570***
						(0.100)
Birth Cohort						
(Birth Cohort 1989-98)[a]						
Birth Cohort 1978-87					0.329***	0.325***
					(0.0446)	(0.0446)
Residential Status[b] (Lagged)						
(Permanent Resident) [a]						
Migrant: Temporary Labor		-0.0876	-0.0901	-0.0891	-0.108	-0.0997
		(0.0875)	(0.0875)	(0.0875)	(0.0874)	(0.0874)
Migrant: Other Reason		-0.630***	-0.612***	-0.611***	-0.579***	-0.570***
		(0.0883)	(0.0884)	(0.0885)	(0.0887)	(0.0887)
Other Residence Status		-0.544**	-0.550**	-0.545**	-0.545**	-0.536**
		(0.237)	(0.237)	(0.238)	(0.237)	(0.237)
Education						
(No Education)[a]						
At least primary				0.0202		
				(0.0757)		
Unknown				0.139		
				(0.532)		
Constant	-22.27***	-22.11***	-22.06***	-22.08***	-22.01***	-22.14***
	(0.395)	(0.395)	(0.397)	(0.403)	(0.396)	(0.397)
Observations	151634	151634	151634	151634	151634	151634
Pseudo-R^2	0.1743	0.1757	0.1763	0.1763	0.1775	0.1782
Log Likelihood	-18922	-18889	-18875	-18875	-18847	-18832

Note: Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

[a] Reference group in parentheses; [b] Time-varying variable, [c] At the time of Conception

Table 4 presents the results from our multivariate event history model in which all time varying covariates are lagged. The results show a strong positive association between age and the probability of having a conception in the following year. The negative squared term indicates a diminution of the age effect such that the probability of first conception begins to decline by age 21. This is consistent with the results from the Kaplan Meier survival analysis which show that median age at first birth in this sample is 21 years. Mozambican refugees who arrived in South Africa prior to 1992 as a result of civil war between government FRELIMO forces and rebel RENAMO forces from rural areas have 40% ($1- e^{-0.516}$) lower odds of conception as compared to South African nationals. However, Mozambican migrants who have arrived in the most recent years after 1992 mainly for economic reasons or were born in the site show 13% higher odds of first conception in a given year as compared to South African nationals. Not surprisingly, marital status has a positive and highly significant association with the probability of conception in the following year. Being in a formal or an informal marital union in the previous year increases the odds of conception by almost 77% as compared to someone not in a union. The findings of associations between age, marital status and ethnicity provided here signal a support for the selection hypothesis as hypothesized in Table 2.

But contrary to expectations, having at least some primary education versus no education does not affect the probability of conception even at 0.1 level of significance. It is possible that this effect is due to the widespread availability of primary education in the study site such that 93% of the sample had had some primary education at the time of first conception or when their observation was censored at the time of last observation. It is also common for girls in rural South Africa to return to school after the birth of the first child, which may mean that educational achievements are accommodated with respect to first birth. The data from this site does not lend itself to a finer measure of education easily. Highest education attained is recorded at four-year intervals but school trajectories are marked with grade repetitions, drop-outs and re-registrations, making a simple interpolation of school years from the available data flawed. It is likely that since primary education is widely available in this rural area of South Africa, the selection effect due to education may only manifest itself for those who enter secondary or tertiary education, where the access to schooling might require more effort or more resource investment on the part of the individual and their families. For instance Lesthaeghe and Page (1981) found that fertility in many African countries was associated not with primary but more advance schooling.

Significant reduction in fertility in the younger birth cohort is in line with the general trend in the site where total fertility rate has continued to decrease from around 4 in the early 1990s to almost reaching 2.3 in 2005. This is also in line with the overall trend in South Africa. However, contrary to expectations, no significant interaction was found between birth cohort and other independent variables indicating that the cohort effect does not express itself differentially with respect to marital status, education or residence status. Perhaps this indicates that the cohort effect is only operating in terms of birth cohort specific increase in age at first conception, as shown by the Kaplan Meier survival estimates. While median estimates were not reached for the younger birth cohort, the results still show that 25% of those in Birth Cohort 1988-98 had a first conception by the age of 18. This is a slight significant increase (based on log rank test for the equality of survival curves) in age at first conception as compared to the Birth Cohort 1978-88, where 25% of the women had reached their first parity by age 17.

Finally, the results for migrant status are noteworthy and of key interest for this paper. We find that there is no difference between the probabilities of conception in a given year for those who were classified as circular migrants for labor purposes in the previous year as compared to those who were permanent residents of the site. The classification as a temporary labor migrant can be interpreted in terms of urban exposure since this measurement precludes short term moves (one-three months), such as seasonal labor on horticulture farms in the surrounding area. Contrary to expectations of adaptation hypothesis (Table 1), urban exposure does not seem to decrease the probability of first birth. White et al (2008) found strong effects of urban residence for women moving from rural-urban areas in Ghana and this effect was strongest at parity 0. However, in this sample no such effects are found.

What might be the explanation for such a lack of association? At least two explanations can be put forward. Both point to the underlying socio-structural processes that cannot be explicitly modeled in the multivariate model. One, as discussed earlier, temporary labor migrant women in the South African context are likely to be employed in the informal sector that might allow increased flexibility with childbearing. The circular nature of the migration and maintenance of significant and regular linkages with the rural home may provide the woman with the necessary social support to accommodate labor migration as a livelihood strategy over the life course along with other key life course outcomes, as family support for childcare in rural home is available.

Two, a large body of literature in South Africa recognizes the phenomenon of sexual networking in the face of high livelihood insecurity, especially by migrant women. This can be seen in terms of a disruption effect which might also lead to higher fertility, for example, in cases where women may be engaging in sexual networking to supplement their income in the initial stages of the move (Akhileswaran, 2005, Luke 2006). Or this effect might continue to persist for longer periods, given the context of severe livelihood insecurity, high rates of unemployment and precarious nature of economic returns in an informal labor market. Studies also show that such relationships tend to have low condom use (although no insights are available for other types of contraception used by women).

In the context of Agincourt, the likelihood of increase in the availability of desirable men to form unions in the destination area is plausible since high levels of men from within the site are migrants and a move to urban areas may increase a woman's opportunities for forming partnerships. Migrant women may simply have a higher pool of eligible men to choose from when forming sexual partnerships in the urban areas. A potential increase in sexual activity due to the tenuous nature of urban residence or due to the availability of more partners would offset other effects of lowering fertility presumed by urban residence and employment related role compatibility hypothesis. This should be coupled with a reminder that South Africa has a high pre-marital fertility and childbirth (and family formation) is not necessarily linked with stable partnership formation, given the legacy of split families created by apartheid where women were effectively forced to raise children in the absence of spouses. This interpretation speaks to the need for a gendered understanding of circular migration, particularly taking into account the reality of African nations with a history of late independence and socio-spatial segregation.

Notably, additional analysis (not shown here) also found that 'cumulative migration experience' based on cumulative addition of each time a person is classified as a labor migrant did not have any significant effect on the probability of conception, proving further

lack of support for the adaptation hypothesis. Further analysis (not shown here) tried to capture the association of the probability of first conception in a given year with change to migrant status in the prior year (from permanent resident status to a labor migrant status) and also found no significant effect, indicating a lack of support for the disruption hypothesis.

However migration for "other reasons" has a strong negative effect on the probability of conception in the following year. This means that the odds of first conception for a woman who was a migrant for other reasons in the previous year are 43% lower as compared to one classified as a permanent resident in the previous year. Data from 2007 temporary labor migration module sheds some light on the nature of this 'other migrant' category. Over 55% of the migrants in this category in the 10-29 age group have migrated for education purposes and 35% for 'family reasons' that may include taking care of relatives, living with relatives, moving with parents etc. Perhaps then, the other migrant category is capturing the selectivity based on educational aspirations of individuals who move out of the study site for higher education as discussed above. This assumption however, cannot be empirically tested with the available data. Additionally, living with family or moving for family reasons at the very least presumes the existence of social networks at the destination, which may decrease the likelihood of forming multiple sexual partnerships in so far as they arise from livelihood insecurity (as may be the case with labor migrants). Such social networks may also provide social sanctions that have an impact upon the likelihood of becoming pregnant. Once again, the need here

Conclusion

The results provide some support for the selection hypothesis (especially in relation to age, ethnicity and marital status but not education). No support was found for the adaptation hypothesis or the disruption hypothesis, although the measures for the latter in the analysis are admittedly limited. Most notably, temporary/circular labor migration does not seem to have the same associations with fertility as predicted by the theoretical migration-fertility hypotheses. These findings lend support to a view of migration in terms of "an interplay between lives and historical time and place, linked lives, timing of lives, and human agency" (Jasso, 2003) to fully understand its association with the onset of childbearing for women in a context of high rural and urban livelihood insecurity like that in South Africa.

Some limitations in the current analysis should be acknowledged and steps will be taken to address at least some of them as additional data from the study site is made available in the following months. As noted before, the measurement of education status is limited and possibilities for some sort of interpolation need to be further examined to refine this measure. Further, marital status and fertility may be jointly determined. To better understand if this mechanism is at work, we intend to take all the person years where a successful conception follows entry into a marital union and see whether the covariates vary for those person years of women. The data currently available is unable to capture spousal separation effects but further analysis of this nature is planned as additional data from the site becomes available. This will help understand the presence or absence of the disruption effect further. We also intend to take this work further with the use of qualitative methods to better understand the context of childbearing and gain a more textured nature of the migration process in the future.

Although data from demographic surveillance sites is not nationally representative and is limited in the depth of information collected, it has several advantages that make it a useful tool to model population behaviors. For one, it gives us the advantage of looking at prospective life histories of a relatively large number of people and study population dynamics of a region over time. In the case of South Africa, DSS data like the one used in this study is one of the few that has collected migration information over time. Post-apartheid expectation of more settled mobility patterns had prompted policy makers to neglect the collection of migration data. Therefore analyzing migration data from DSS sites can provide important insights into migration patterns and its impact upon other population dynamics for South Africa.

Thinking of it migration as a process negotiated over the life course of an individual that shapes socio-demographic behavior in an interactive manner is valuable from not only as a contribution to demographic theory but also from a developmental perspective. A better understanding of the factors that shape migration and fertility decisions in the context of circular migration can help encourage more evidence based policy making that speaks to the social reality of rural populations in South Africa, as well as other countries in Africa and Asia with similar patterns of circular migration. But perhaps most importantly, thinking of demographic processes as situated squarely within the socio-structural and historical dynamics stretches the bounds of demographic theories. It forces us to recognize that structural forces are cannot simply be relegated to the black box of residuals in quantitative analyses but must be used, at the very least, as narratives that shape human behavior and social practices.

Bibliography:

Akileswaran, C. 2005. 'Mobile Populations: Women: A Vulnerable Mobile Population.' AF-AIDS eForum 2005: af-aids@eforums.healthdev.org

Bach, R. L. (1981) Migration and Fertility in Malaysia: A Tale of Two Hypotheses *International Migration Review*, Vol. 15, No. 3 (Autumn), pp. 502-521

Bongaarts, J. 1978. A Framework for Analysing the Proximate Determinants of Fertility, Population and Development Review, 4 (1): 105-132.

Boyd, M. (2003) *Women and migration: incorporating gender into international migration theory* in Migration Information Resource 2003 www.migrationinformation.org Accessed on 25th March 2005.

Bledsoe C.H. and Cohen B. 1993. Social dynamics of adolescent fertility in sub-Saharan Africa. Washington DC: National Academy of Sciences Press.

Bozzoli, B with Nkotsoe M. (1991) *Women of Phokeng: Consciousness, life strategy and migrancy in South Africa, 1900 – 1983*. Johannesburg: Ravan Press.

Casale, D. and Posel, D. 2002. 'The Continued Feminisation of the Labor Force in South Africa: An Analysis of Recent Data and Trends.' *The South African Journal of Economics* 70(1):156-184.

Collinson, M., Tollman, S., Kahn, K. and Clark, S. 2006. "Highly prevalent circular migration: Households, mobility and economic status in rural South Africa." in *Africa on the Move: African Migration and Urbanisation in Comparative Perspective,* M Tienda, S Findley, S. Tollman and E. Preston-Whyte (eds), Johannesburg: Wits University Press.

Caldwell, J. 1982. Theory of Fertility Decline. London: Academic Press.

Chattopadhyay, A., M. J. White, and C. Debpuur. 2006. Migrant fertility in Ghana: selection versus adaptation and disruption as causal mechanisms, Population Studies 60(2): 1–15.

Chimere-Dan, O (1999). Marriage and the Fertility Transition in South Africa. Paper presented at the Third African Population Conference: The African Population in the 21st Century. Durban, 6-10 December 1999.

Clausen, J. A. 1991. "Adolescent Competence and the Shaping of the Life Course." American Journal of Sociology 96: 805-842.

Elder, Jr, Glen H. 1994. "Time, Human Agency, and Social Change: Perspectives on the Life Course." Social Psychology Quarterly 57(1): 4-15.

Goldstein, A., M. White, and S. Goldstein. 1997. Migration, fertility and state policy in Hubey Province, China, Demography 34(4): 481–491.

Garenne, M. Stephen M. Tollman, Mark A. Collinson and Kathleen Kahn. 2007. Fertility trends and net reproduction in Agincourt, rural South Africa, 1992_2004 1 Scandinavian Journal of Public Health, 2007; 35(Suppl 69): 68–76.

Harrison, A. 2007. 'A Context of "Non-Marriage": Non-marital Unions in the Transition to Adulthood in South Africa'. Paper presented at the Symposium "Rethinking Relationships" Population Studies and Training Center, Brown University, April 19, 2007.

Hogan D, Astone N. 1986. The transition to adulthood. Annual Review of Sociology 12 (1986):109-130.

Hunter, Mark. 2007. The changing political economy of sex in South Africa: the significance of unemployment and inequalities to the scale of the AIDS pandemic. Soc Sci Med 64(3): 689-700.

Hunter, Susan-Catherine, Raphael Isingo, J. Ties Boerma, Mark Urassa, Gabriel M. P. Mwaluko and Basia Zaba (2003)"The Association Between HIV and Fertility in a Cohort Study in Rural Tanzania." Journal of Biosocial Science 35: 189-199.

Jasso G. 2003. Migration, human development, and the life course. Handbook of the Life Course, Chapter 16.

Kulu, H., and N. Milewski. 2007. Family change and migration in the life course: An introduction. Demographic Research 17(18): 541–564. www.demographic-research.org/Volumes/Vol17/18/default.htm.

Lesthage R. and Page, H. 1981. *Child Spacing in Tropical Africa*. New York, Academic Press.
Lindstrom D and Saucedo, G S. 2002. The short- and long-term effects of U.S. migration experience on Mexican women's fertility. Social Forces 80(4): 1341-1369

Luke, N. 2006. 'Exchange and Condom Use in Informal Sexual Relationships in Urban Kenya.' Economic Development and Cultural Change. Vol. 54 (319–348).

Macmillan R, Eliason S. Characterizing the life course as role configurations and pathways: A latent structure approach. Handbook of the Life Course, Chapter 24.

Magidson, J. and Vermunt, J.K. (2003). Comparing latent class factor analysis with the traditional approach in datamining. H. Bozdogan (ed.), Statistical Data Mining and Knowledge Discovery, 373-383. Boca Raton: Chapman & Hall/CRC.

Massey, D. S. and Aysa, M. 2005. Social Capital and International Migration from Latin America. Expert Group Meeting on International Migration and Development in Latin America and the Caribbean. Population Division, Department of Economic and Social Affairs, United Nations Secretariat Mexico City, 30 November – 2 December 2005

Ndegwa, D, Horner, D, Esau F. 2004. 'The Links Between Migration, Poverty And Health: Evidence From Khayelitsha And Mitchell's Plain.' Centre for Social Science Research (CSSR) Working Paper No. 73. UCT.

Nesvåg, S. 2000. 'Street Trading from Apartheid to Post-Apartheid: More Birds in the Cornfield?' International Journal of Sociology and Social Policy. Vol. 21, Issue 3/4

Orrenius P. M. & Madeline Zavodny & Leslie Lukens, 2008. "Why stop there? Mexican migration to the U.S. border region," Working Papers 0803, Federal Reserve Bank of Dallas.

Posel, D. 2003. 'Have Migration Patterns in post-Apartheid South Africa Changed?' Paper prepared for Conference on African Migration in Comparative Perspective. Johannesburg, South Africa.

Singh, G. 2007. "Paradoxical Payoffs: Migrant women, work and health in South Africa." New Solutions: A Journal of Environmental and Occupational Health Policy. Volume 17, Number 1 - 2 / 2007, Baywood Publishing. Canada.

Swartz, L. 2002. Fertility transition in South Africa and its implications on the four major population groups.In: Expert Group Meeting on Completing the Fertility Transition, New York, 11-14 March 2002, [compiled by] United Nations. Department of Economic and Social Affairs. Population Division. New York, New York, United Nations, Department of Economic and Social Affairs, Population Division, 2004. :539-553.

White, M., L. Moreno, and S. Guo. 1995. The interrelation of fertility and geographic mobility in Peru: a hazards model analysis, International Migration Review 29(2): 492–514.

Zhou X, Hou L. 1999. Children of the cultural revolution: The state and the life course in the People's Republic of China. American Sociological Review 64:12-36.